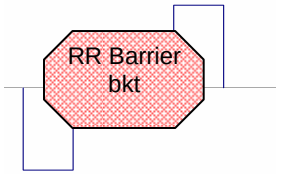


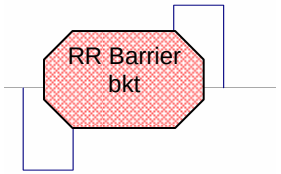

# Pbar Stacking in the Recycler:
# Longitudinal Phase-space Coating

**Chandra Bhat**

October 19, 2005

**Recycler Group Meeting**

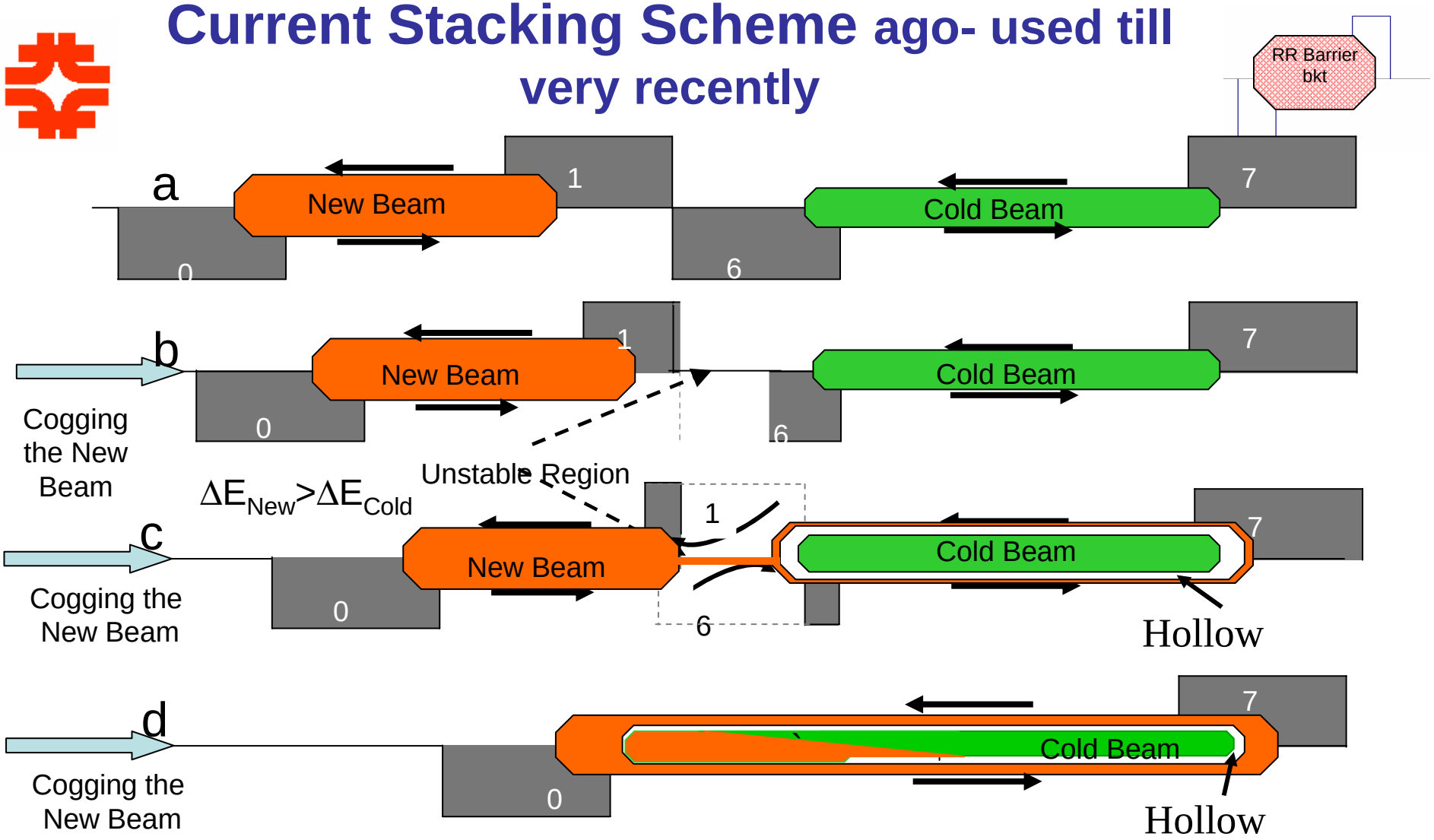
# Primary Goal




- Develop a more viable pbar stacking technique at the Recycler.
  - Should capable to give no LE growth for the cold stack
  - Should capable to give no or very small emittance growth for the transferred beam

Let us quickly examine how the present and proposed beam stacking schemes do to the beam.

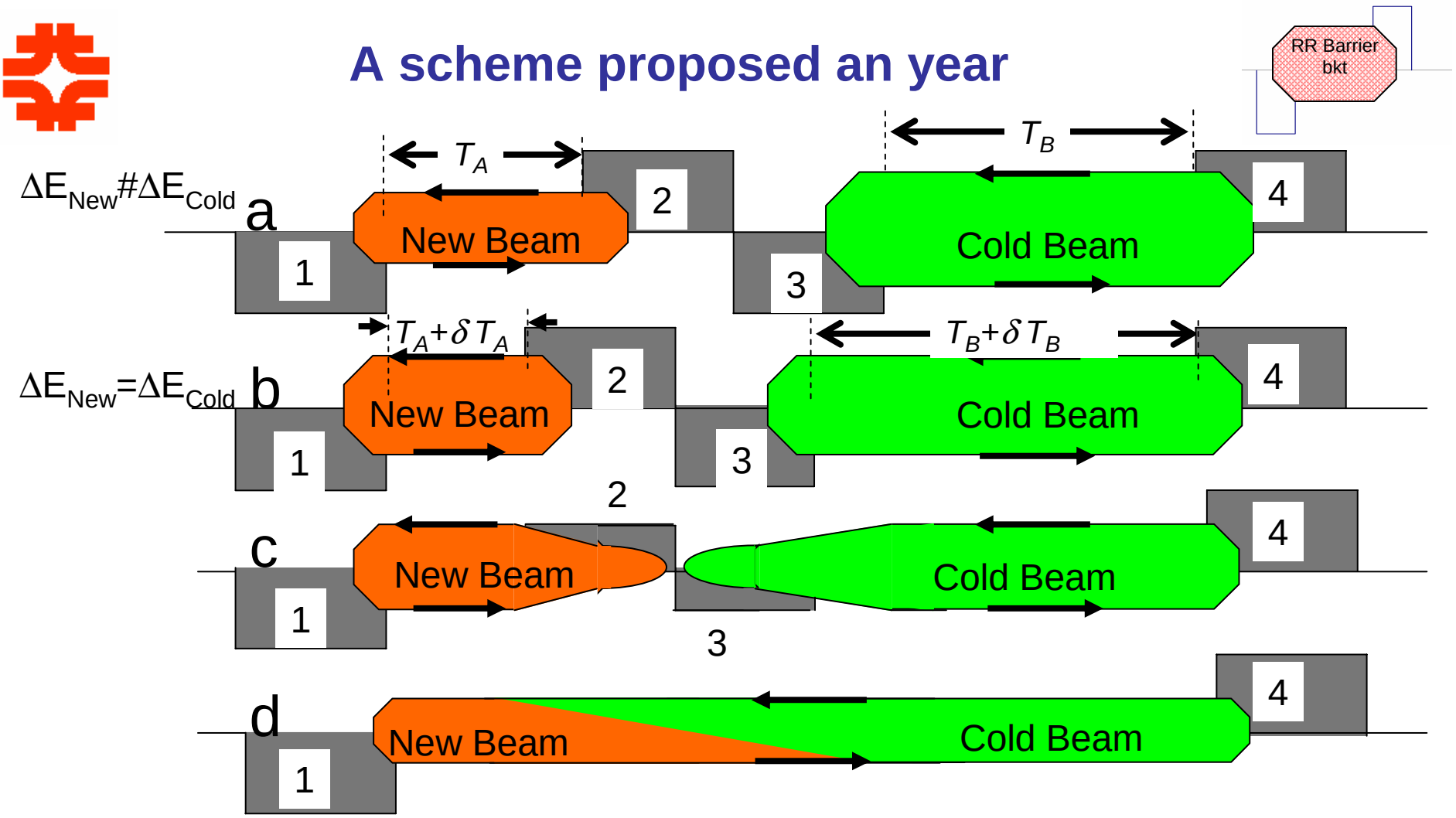
# Current Stacking Scheme ago- used till very recently




**Example:**
**LE(cold) = 70 eVs, LE (New) = 10 eVsx5-transf., LE(expected)=120 eV**
**Predictions: ΔLE/transfer ≈30% ; Goal: ΔLE/transfer <15%**

**Issue:** **LE(Final) ≈ 150 eVs, ΔLE ≈ 25% and ΔLE/transfer ≈ 60%**

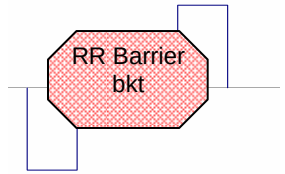
# A scheme proposed an year



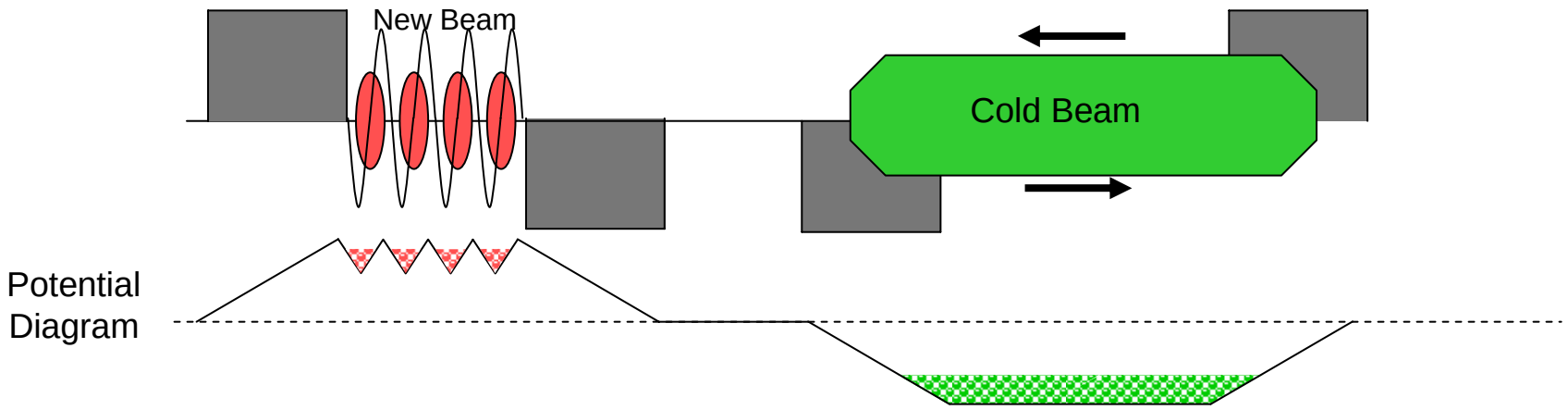

Example:
LE(cold) = 47±3 eVs, LE (New) = 14±1eVs LE(expected)=61±3 eV
LE(Final) ≈ 68±3 eVs, ΔLE/transfer = 11%, the Best ΔLE/transfer =2%
Predictions: ΔLE/transfer<5%

**Issue:** **But, in this scheme the cold beam got disturbed ← need to be eliminated**

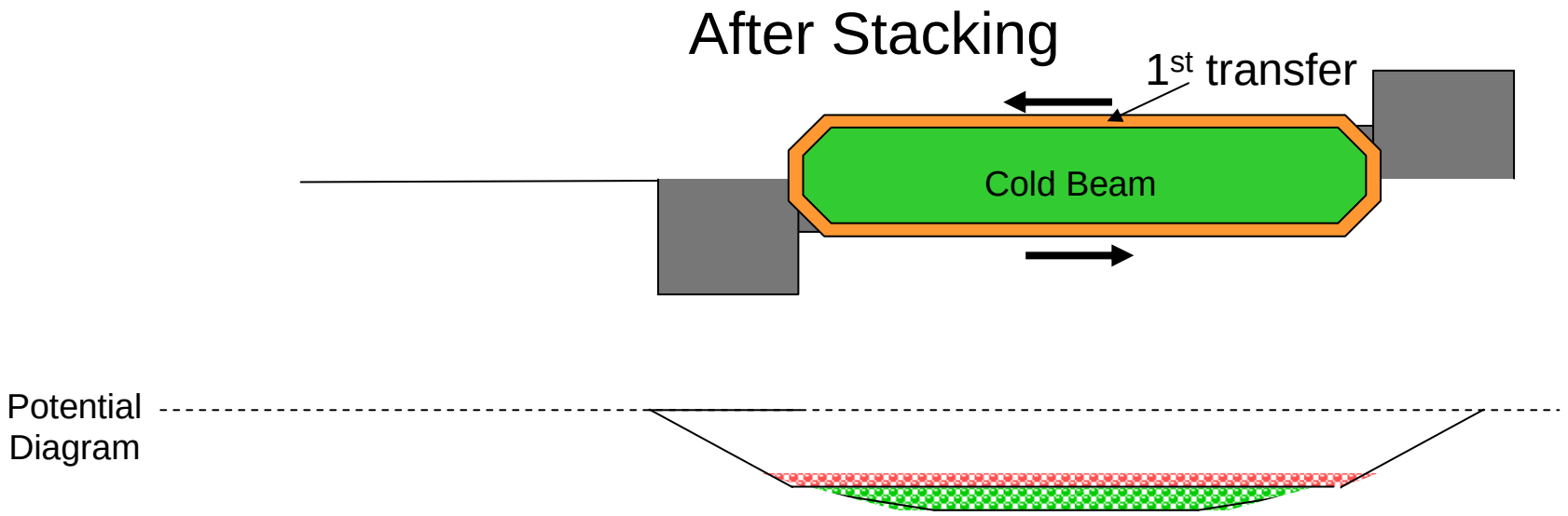
# What is Longitudinal Phase-space Coating?



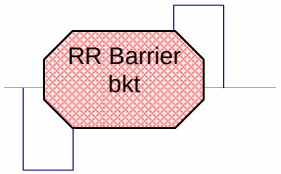

1st Injection




After Stacking

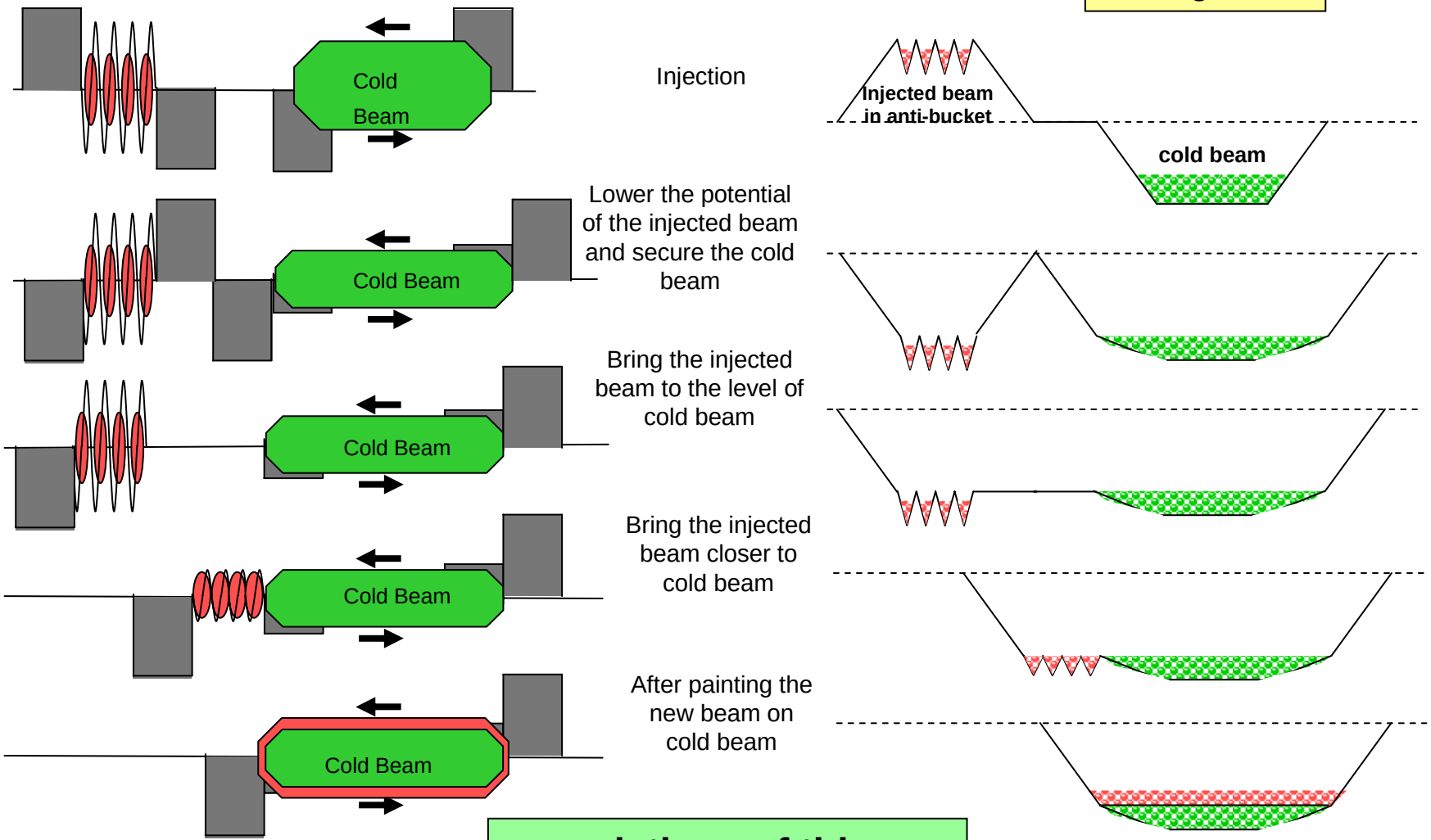


# Sequences of Longitudinal Phase Space Coating




**Voltage Waveforms & Phase-space distributions**

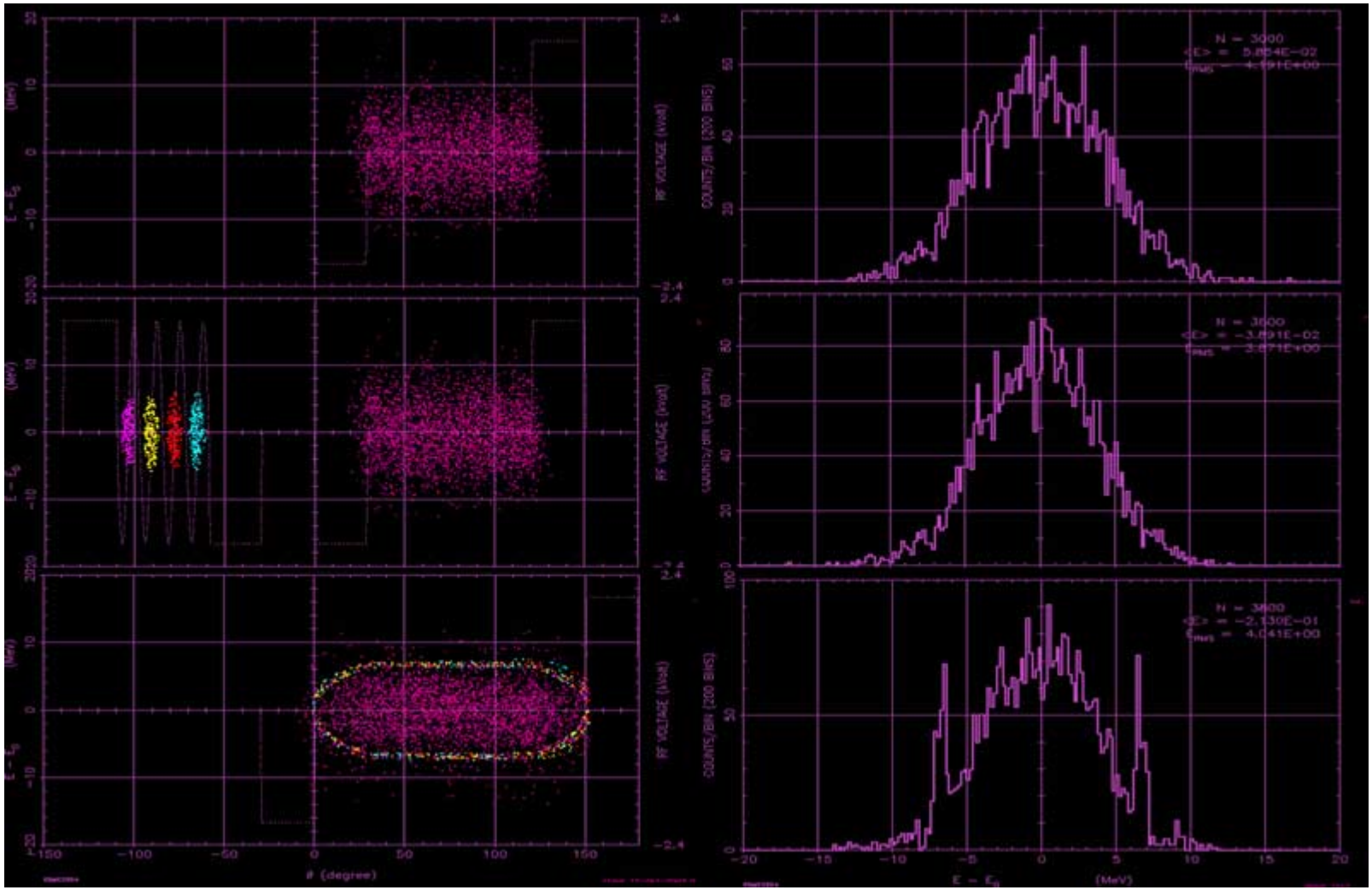
**Potential diagram**




**or variations of this ….**

# Simulations

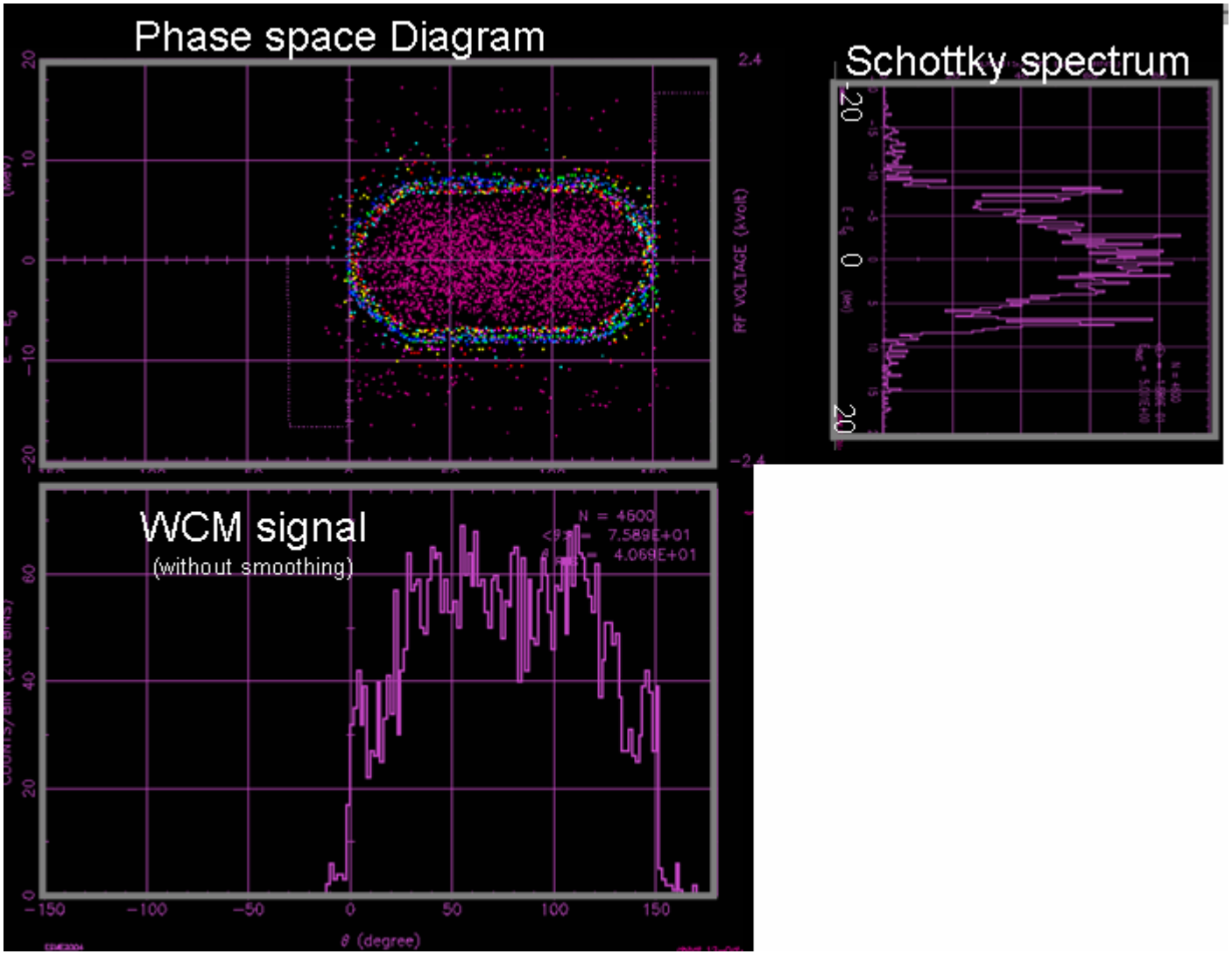
## (Gaussian Distribution for the Cold Core)



# Simulations Cont.:

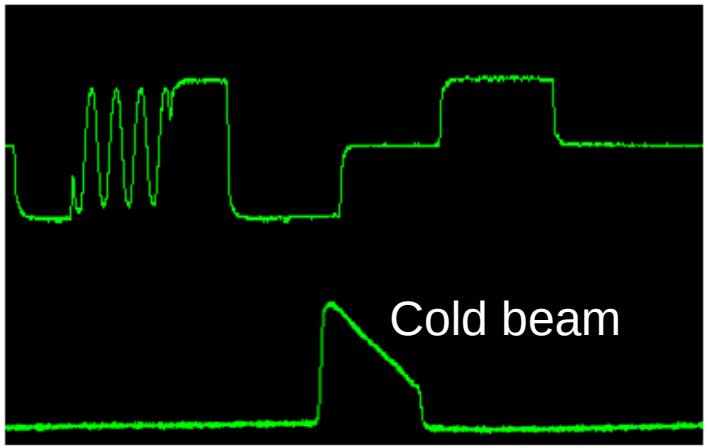
## A case after 2-transfers

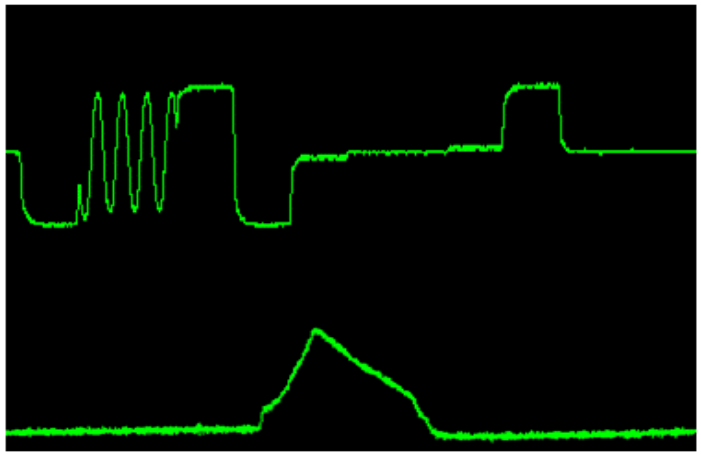
RR Barrier bkt



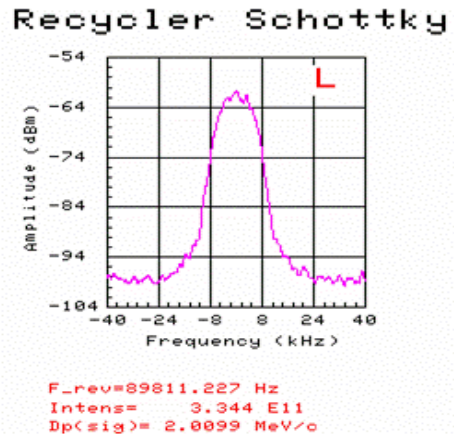
# Beam Studies
## (preliminary)

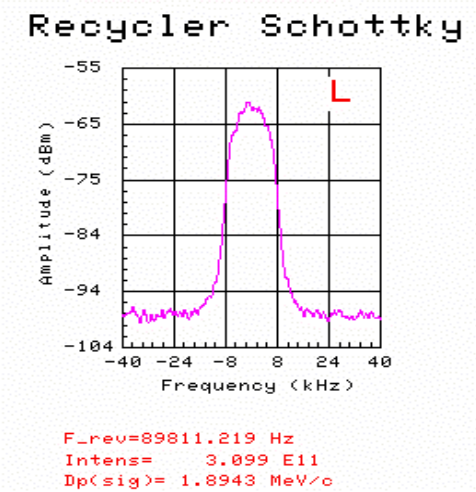
RR Barrier bkt



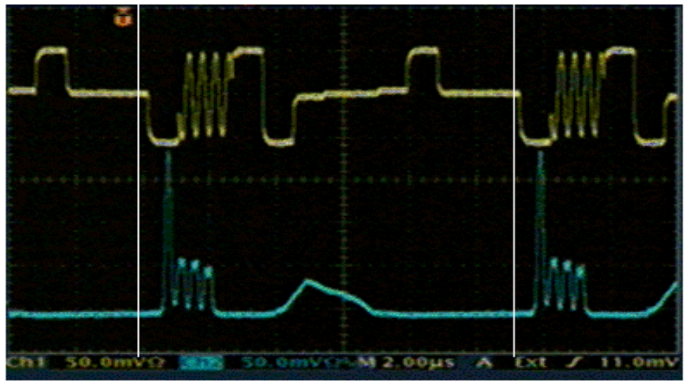
11.11$\mu$sec

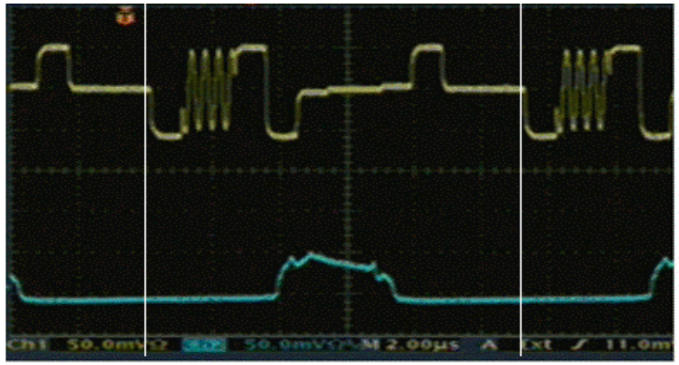


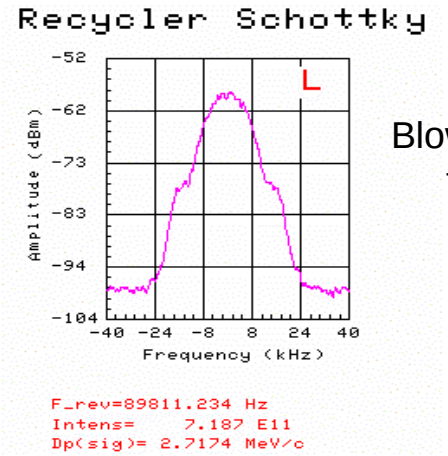

Match cold beam for 2$\sigma$ ~4MeV

# Beam Studies
## (preliminary)

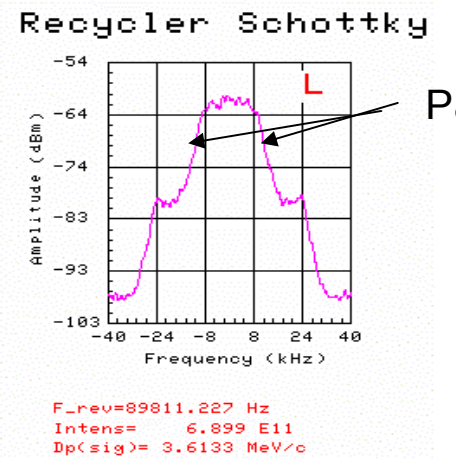




11.11$\mu$sec

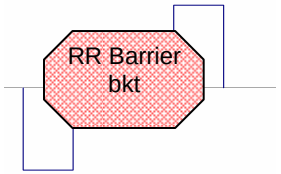



Beam Blowup during transfer




Painted beam

# Summary




- Proposed a new viable technique for pbar stacking
  - Minimum disturbance to the cold stack
  - Minimum LE growth for the newly arrived pbars
  - Easily adoptable
- Did preliminary beam experiment and beam dynamics simulation. Results are very encouraging ←Analysis is progress
- May have applications in the other related topics in beam physics